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THE NEBRASKA PERMIAN[1]

WHETHER or not true Permian rocks occur in Nebraska has been an open question for many years. Nevertheless, it has been customary for geologists mapping southeastern Nebraska to assign to it a narrow belt of territory extending from a point on the Nebraska-Kansas line sixty miles west of the Missouri River, north and east to Omaha. So far as the literature on the subject goes, there is absolutely no data that would warrant this construction. Probably these maps have been constructed upon the supposition that, since Permian rocks were known in Kansas, they might extend northward into Nebraska, and in case they did they would be found between the Carboniferous Coal Measures and the Dakota sandstone of the Cretaceous.

Professor Marcou[2] was the first geologist to suggest the occurrence of Permian rocks in Nebraska. Prior to that time the Paleozoic escarpments along the Missouri River had been considered Carboniferous by both Nicollet[3] and Owen.[4] In studying this region Professor Marcou made a very thorough examination, and it was his candid opinion that the rocks were

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[1] In 1885, while a student in the University of Nebraska, the question of the occurrence of the Permian rocks in Nebraska came up in class and was thoroughly discussed, some maintaining the statements of Marcou, others those of Meek. The result was anything but satisfactory, and Dr. Hicks suggested to me that it would be a good plan to investigate the Paleozoic rocks of Nebraska and determine, if possible, whether there were any rocks that could be assigned to the Permian. This was carried out. The Missouri River, Platte River, Cass, Otoe, Richardson, Johnson, and Pawnee counties were visited, and Meek's conclusions that these rocks were Coal Measures confirmed. Still believing that the Permian rocks might occur in the southern portion of the state, work was resumed in Gage county. The data collected at that time are here presented in their original form, except that there are numerous references to Prosser's papers.

[2] Bull. Soc. Geol. France, 2 ser., Jan. 1864, Vol. XXI, pp. 134–137.

[3] NICOLLET'S map.

[4] Report of the Geol. Surv. of Wis., Iowa, and Minn., and incidentally of a portion of Nebraska Territory, pp. 133–135.

Dyas (Permian). Later Professor Geinitz,[1] of Dresden, studied the fossils collected by Professor Marcou, and in an article confirmed Marcou's classification. The work of Marcou and Geinitz called forth some severe criticism from American geologists, which culminated in Professor Meek's masterly production in the Final Report of the U. S. Geological Survey of Nebraska, in which he proved conclusively that the Missouri River rocks extending from the mouth of the Platte River, southward along the Missouri River in Nebraska, were Coal Measures. The only recent publication bearing on the subject of the Missouri River rocks in Nebraska is an article published by Professor Prosser,[2] in which he strongly supports Meek's views. Without question these rocks must be considered Coal Measures.

Early investigators paid little or no attention to the Paleozoic exposures lying some distance west of the Missouri River. While making his reconnaissance for the final report on the geology of Nebraska, Dr. Hayden suggested that the true Permian rocks as found in Kansas might occur in some of the southern counties of Nebraska. However, his statements are very confusing and assure one that he had not arrived at any definite conclusion. While suggesting in a footnote[3] that the Kansas rocks might extend northward into Nebraska, on the same page, in discussing the Beatrice section, he says: "Beds 1, 2, and 3 of the above section are undoubtedly Permian or Permo-carboniferous, though they contain fossils common in both Permian and Carboniferous rocks. . . . . Bed 4 seems to form a sort of a transition bed between Permian and Carboniferous formations. The Permian rocks pass beneath water level at Beatrice westward," etc. The fossils on which the above statements in reference to the Beatrice section were made were *Syntrilasma* (*Enteletes*) *hemiplicata* and *Pinna peracuta*. Dr. Hayden visited many outcrops within the Permian area in Gage county while making his survey. In his report he mentions the bands of cherty limestone so characteristic of the Kansas beds and many other features that could only lead one to correlate these formations. Unfortunately, it has been found impossible to identify Dr. Hayden's sections along the Big Blue River. The reasons for this are apparent when it is known that he speaks of the bluffs at Blue Springs as being from ten to fifteen feet high, when in reality they vary from fifty to ninety above the river. Since Dr. Hayden's report nothing of importance was published pertaining to these rocks until 1886, when L. E. Hicks,[1] then Professor of Geology in the University of Nebraska, published two short papers. These articles were so general in character that it was impossible for any one to arrive at any definite conclusion regarding the area under discussion. In 1897 Prosser published two articles in which he discussed and reviewed the work of previous writers on the Paleozoic of Nebraska, and compared the Missouri River rocks with the Kansas beds. In the first of these articles[2] Prosser refers briefly to the exposures along the Big Blue River, and concludes by saying: "These rocks are undoubtedly of Permian age, and it is probable that the Neosho formation, and possibly a part of the Chase, occurs in Gage county."

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[1] M. d. K. Leop. Carol. Acad. d. Naturl. Carbonformation und Dyas in Nebraska. Dresden, pp. vii + 91. 5 plates.

[2] JOUR. GEOL., Vol. V, No. 1, pp. 1–16, and No. 2, pp. 148–172.

[3] U. S. Geol. Surv. of Nebraska, final report, p. 28.

Since the discovery of Permian rocks in Kansas by Swallow[3] there has been a considerable time devoted to their study by numerous geologists. The stratigraphical features are well known and the fauna has been carefully studied, although there is much to be accomplished in a more exhaustive study of the fossil life. Recently Prosser[4] has brought together all of the history bearing on these rocks, and added much valuable information to the literature by a careful examination of the many exposures. His classification must stand as a basis for correlating the Permian rocks of the central western United States.

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[1] Transactions A. A. A. S., Buffalo meeting, 1886, and the American Naturalist, Oct. 1886, pp. 882, 883. The data embodied in these two articles were taken from my notes.

[2] JOUR. GEOL., Vol. V, p. 12.

[3] See Trans. Acad. Sci. St. Louis, Vol. I, pp. 111, 112.

[4] See Bull. Geol. Soc. Am., Vol. VI, pp. 29–54; JOUR. GEOL., Vol. III, 1895, pp. 682–705 and 764–800; University Geol. Surv. of Kansas, Vol. II, pp. 55–96. See also an article by PROFESSOR HAWORTH in the University Geol. Surv. of Kansas, Vol. I, pp. 185–194.

The Nebraska Permian is the northern extension of Kansas beds, and agrees with them in all of the essential characters. The area is of a flatiron shape, with the broad end to the south resting upon the Kansas-Nebraska line. The northern limit is probably in the vicinity of Roca, Lancaster county. On the east the boundary has only been approximated, since the highlands separating the valley of the Nemaha from the valley of the Big Blue River, are so deeply buried with loess that there are few, if any, rock exposures. Typical Permian rocks were found near the eastern line of Gage county, and Coal Measures near Pawnee City, Pawnee county. From these data it is supposed that the eastern boundary of the Permian extends from Roca south and east into Johnson county, thence southward through the western end of Pawnee county into Kansas. The western boundary, from Roca to Beatrice, is also buried beneath a very thick bed of loess; but from Beatrice southward it was traced with considerable accuracy, since there were numerous outcrops of both Permian and Dakota sandstone. Only a short distance west of Beatrice the Dakota sandstone crosses the river and trends south and east along the southwestern border of the valley of the Big Blue River to a point known as "The Mounds," which is a high bluff capped by Dakota sandstone on the west bank of the river some two miles west of Holmesville. From this bluff, the highest in this section of the country, the boundary trends south and west, passing several miles west of Blue Springs, thence westward along the north side of Indian Creek to a point about two miles west of Odell, where it crosses the creek and turns eastward and follows the south side of the valley of Indian Creek nearly to the Big Blue River, where it bends southward and keeps a southern course to the Kansas line. As bounded, this area, comprising nearly five hundred square miles, is nearly confined to Gage county, and, with the exception of that portion in

Lancaster county, is drained by the Big Blue River and its tributaries. This river enters the central western border of the Permian field and flows eastward and southward through the western half into Kansas. All of its tributaries in the Permian rocks are small streams and of little importance.

The topography of this region is wholly unlike that of any other part of the state. There are highlands of almost level prairie, which change gradually into rolling prairie, and in some localities the rolling prairie shades into rough and broken country that is only fitted for pasture land. As the tributaries approach the river they usually flow through narrow, deep ravines or gulches, and in numerous places there are miniature canyons with precipitous walls of cherty limestone. The Big Blue River flows through a gradually narrowing valley. At Beatrice the bluffs are low and well rounded and the valley quite wide. In the vicinity of Holmesville, the bluffs are very much higher and steeper, and near the Kansas line they are from fifty to one hundred and fifty feet high and in many places very precipitous. Where the exposures approach the perpendicular the walls are usually cherty limestone. The chert, which is almost black, occurs in regular bands of varying thicknesses. These exposures, when viewed from a distance, with their alternating layers of light and dark stone, partly vine-clad, remind one of the work of man rather than nature; and it does not require a vivid imagination for one to see ruin after ruin as the eye wanders down the river; here an old fortress, there an old church, and in the distance the rude outline of an old crumbling castle. This rugged scenery, mingled with the many groves and the winding river, makes this one of the most picturesque localities of the state. The elevation of this region above the sea varies from 1150 feet, at the state line, to about 1300 feet, on the divide between Roca and Beatrice. Judging from the deposits of drift along the river, the Permian has undergone glaciation. There are a few V-shaped troughs, varying in depth from two to five feet, and these are usually filled with granite and quartzite pebbles and sand. The Big Blue River was very near the southwestern limit of the great ice sheet. North and east of Holmesville there are a few isolated patches of Dakota sandstone that have escaped glaciation.

In studying the Permian, work was commenced at Roca, but on account of the slight exposure and the scarcity of fossils, no detailed examination was made. A few specimens of *Enteletes hemiplicata* (Hall) were all the fossils seen, and the vertical range of this species is too great to allow it as evidence for or against the Permian. In the vicinity of Beatrice, only two slight exposures of yellowish shelly limestone were found. One of these was just below the dam, on the east bank of the river, and the other on the west side of the river in a ravine about a half mile southwest of the upper bridge. These rocks[1] were barren of fossils. By following the Union Pacific railroad down the river about a mile below town, a slight exposure of very poor limestone was found in a cut. From this point southward the limestone surface along the bluffs gradually rises above the railroad grade which follows the course of the valley. Three miles below Beatrice at the old cement mill, the following section was taken:

No. 4.	Soil and drift	4 feet
No. 3.	Yellowish shelly limestone	4 feet
No. 2.	Cellular light gray limestone	13 feet
No. 1.	Bluish hydraulic limestone	8 feet
	Total,	29 feet

No. 1 of this section was utilized during the seventies for manufacturing hydraulic cement. Nos. 1 and 2 contained the following fossils:

Productus semireticulatus Martin.
Ambocelia planoconvexa Shum.
Meekella striatioconstata Cox.
Seminula argentea Shep.
Bellerophon sp.

From the old cement mill down along the river on the east bank there are numerous exposures of the above section. At "The Mounds" the Permian is capped with about forty feet of brown Dakota sandstone, and the junction of the two formations is entirely obliterated with soil and débris. Numerous slight exposures of Permian rocks were found that were above the cement mill section and with them *Seminula argentēa* (Shep.) but no other fossil.

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[1] DR. HAYDEN reports two species. See final report of the U. S. Geol. Surv. of Nebraska, p. 28.

At Holmesville there were numerous exposures and many of them had been opened as quarries. To the north of the depot there is a quarry face over a quarter of a mile in length and averaging twenty feet in height. The limestones of this quarry are all thick bedded and one band has a peculiar habit of changing in color from a bluish to a cream color within a distance of twenty feet. South of the bridge there is a thin bed of oölite that thickens rapidly toward the south. It is very fossiliferous, but thins out before reaching the quarries north of the depot, where the following section was made :

No. 5. Soil, sand and drift - - - - - -	9 feet
No. 4. Yellowish to bluish limestone with geodes filled with quartz crystals, in some places cellular and containing fossils - - - - -	10½ feet
No. 3. Bluish limestone - - - - -	4 feet
No. 2. Cherty limestone - - - - - - -	6 feet
No. 1. Unexposed to the river - - - -	14 feet
Total - - - - - - -	43½ feet

The oölite has not been included in this section but belongs between Nos. 3 and 4, which are quarried for building purposes. The following fossils were taken from the oölite and No. 4.

Productus semireticulatus Martin.
Meekella striatiocostata Cox.
Aviculopecten occidentalis Shum.
Aviculopecten sp.
Aviculopecten sp.
Schizodus ovatus M. and H.
Schizodus wheeleri Swal.
Schizodus sp.
Yoldia subscitula M. and H.
Bakevellia parva M. and H.
Edmondia sp.
Edmondia sp.
Loxonema sp.

Pleurotomaria sp.
Murchisonia nebrascensis Gein.
Bellerophon montfortanus N. and P.
Naticopsis cf. *remex* White.

Southwest of Holmesville two and a half miles, on the west bank of the river, there is a long escarpment of very excellent limestone, that in early days was quarried and transported by wagons as far as Lincoln, to be used for building purposes. It occurs in good workable beds and breaks across the bedding as well as with it. When the stone is taken from the quarry it is easily cut with saw or plain, but upon exposure it becomes very much harder. When large dry blocks are struck with a hammer they have a metallic ring. It has been called magnesian limestone, and resembles very much the so-called magnesian limestones, that have been quarried from the Kansas Permian for many years.

SECTION OF QUARRY

No. 6.	Cream colored limestone	⅚ foot
No. 5.	" " "	2½ feet
No. 4.	" " "	3⅓ feet
No. 3.	" " "	3 feet
No. 2.	" " "	3 feet
No. 1.	Bluish and gray limestone	8 feet
	Total	20⅔ feet

The position of this section in reference to Holmesville is questionable. Levels were not run but there is some evidence that it occupies a place lower than the Holmesville bed. Possibly it may represent the Holmesville section in part; the differences in the strata being accounted for by a difference in sedimentation. Only a few fossils were found.

Aviculopecten occidentalis Shum.
Sedgwickia alteristriata? M. and H.
Myalina aviculoides M. and H.
Derbya robusta Hall.
Edmondia sp.
Pleurophorus sp.
Slight impressions of *Nautilus* or *Metacoceras* and a large pelecypod.

The next examination was made at Blue Springs. The bluffs opposite the town are from fifty to ninety feet above the river bed and extend down the stream for two or three miles. The most striking feature of these bluffs is the thick bed of cherty limestone that has not been seen to the northward, but which may yet be found at "The Mounds," or along some of the highlands away from the river. Below the cherty band along the bluffs, the slopes are in many places paved with large blocks of cherty limestone that have been loosened by frost. Above the cherty layer, there are several bands of workable limestone that have been quarried for building purposes. While the Blue Springs exposure is above the Holmesville, it is not definitely known what it rests upon. It is quite possible that there is a series of rocks intervening that have not been discovered.

BLUE SPRINGS SECTION

No. 10.	Soil	2 feet
No. 9.	Yellow shelly limestone	5½ feet
No. 8.	Compact yellowish limestone containing vertebrates and many invertebrates	7½ feet
No. 7.	Cherty limestone, fossiliferous	1½ feet
No. 6.	Yellowish soft limestone	1⅔ feet
No. 5.	Cherty limestone, fossils in chert	16 feet
No. 4.	Indurated and variegated marls	20 feet
No. 3.	Bluish limestone	10 feet
No. 2.	Unexposed	10 feet
No. 1.	Bluish limestone	3 feet
	Total	69⅔ feet

Nos. 7 and 8 contain a great many fossils, some of which are new to science. The following were collected:

Productus semireticulatus Shum.
Meekella striatiocostata Cox.
Orthis sp.
Seminula argentea Shep.
Aviculopecten occidentalis Shum.
Aviculopecten maccoyi M. and H.
Aviculopecten sp.
Orbiculoidea sp.

Orbiculoidea sp.
Bellerophon sp.
Myalina permiana? Swal.
Rhombopora lepidodendroides? Meek.
Myalina aviculoides M. and H.
Dentalium sp.
Derbya crassa M. and H.
Derbya robusta Hall.
Strapharollus subrugosus M. and H.
Archeocideris sp.
Fenestella sp.
Polypora sp.
Fistulipora sp.
? ? Ceromya sp. probably a new genus of pelecypods.
Vertebrates:
  Styptobasis knightiana Cope.
  Diplodus sp. nov.

Professor Cope[1] in describing Styptobasis as a new genus remarked: "This was a large shark of carnivorous habits, and its presence indicates the existence of a marine fauna whose remains have not been discovered." Associated with No. 8 was a huge Pinna nearly three feet long.

Quarries and exposures were also examined in the vicinity of Wymore, but no additional data were secured, since the sections were the same as at Blue Springs.

At Odell several slight exposures were found along the bluffs, and one in a small gulch west of the town. From the last one mentioned a single specimen of *Chænomya minnehaha* (Swal.) was taken. On account of the exposures being slight, and no chance to study more than a few feet of limestone, the Odell region was not worked over. From a few measurements of rock in place the dip was found to be slightly to the southwest.

The exposures along the river south from Wymore, are very numerous and in many places form continuous bluffs, but none of these were critically examined until the Kansas-Nebraska line was reached. Here there were the finest exposures seen along the river, and they were also quite accessible for study. The cherty band as seen at Blue Springs can be seen on every bluff, and the limestones above resemble the stone quarried at the Blue Springs quarries. But above all of these bands, there are several that have not been seen to the north. The following section was made at the state line.

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[1] See COPE'S description, Proceedings of the U. S. Nat. Museum, Vol. XIV, pp. 447, 448.

No. 7.	Yellowish oölitic limestone - - -	8½ feet
No. 6.	Light colored limestone, shelly - - -	4 feet
No. 5.	Yellowish limestone - - - -	8 feet
No. 4.	Light colored limestone with some chert -	13 feet
No. 3.	Very cherty limestone - - - -	15 feet
No. 2.	Indurated marls, variegated - - -	15 feet
No. 1.	Unexposed to the river - - - -	20 feet
	Total - - - - - - - -	73½ feet

No fossils were found below the cherty bands. Nos. 5, 6, and 7 contained a great many fossils, No. 7 being especially rich in species as well as in numbers. The following is a partial list. Many of the fossils were so frail that by the time they had been packed, shipped, and unpacked no one could identify them,

Nautilus eccentricus M. and H.
Metacoceras dubium Hyatt.
Metacoceras sp.
Myalina aviculoides M. and H.
Myalina perattenuata M. and H.
Myalina permiana Swal.
Myalina sp.
Seminula argentea Shep.
Pseudomonotis hawni M. and H.
Pseudomonotis hawni ovata M. and H.
Pseudomonotis sp.
Meekella striaticostata Cox.
Derbya crassa M. and H.
Derbya robusta Hall.
Aviculopecten occidentalis Schum.
Aviculopecten sp.
Bakevellia parva M. and H.
Pinna sp.
Yoldia subscitula M. and H.
Schizodus sp.

Schizodus sp.
Solenomya sp.
Solenomya sp.
Fenestella sp.
Pleurophorus sp.
Edmondia sp.
Scaldia sp. nov.
Allorisma subcuneata M. and H.
Allorisma cf. *elegans* King.
Chaenomya laevenworthensis M. and H.
Bellerophon marcouanus Gein.
Bellerophon sp.
Avicula cf. *lanceolata.*
Orthoceras sp.

At Oketo, Kan., two miles south of the state line, there are large quarries worked in the bands above the cherty limestone. The exposures along the bluffs at Oketo were the same as seen at the state line, except there were a few new bands above the oölitic limestone. The cherty limestone band that has been traced from Blue Springs to the state line and on to Oketo is, beyond question, the same band that outcrops to the north of Marysville, Kan., and that it is the Florence[1] flint of Prosser's Chase formation. If this correlation is correct, the cherty limestone that is only partly exposed at Holmesville will equal the Strong flint of Prosser's Kansas section, in which case the Chase formation would extend as far north as Beatrice, and the Neosho from Beatrice to Roca. There are some stratigraphical differences noted while comparing the formations of the two states, but this will undoubtedly disappear with more detailed study. The most marked is the occurrence of oölites in Nebraska that have not been reported from Kansas. Prosser calls the variegated band underlying the Florence flint a shale, while the same band in Nebraska is an indurated marl. At all exposures attempts were made to take the dip, but as a rule the readings were anything but satisfactory. At Holmesville and Blue Springs there were places, which appeared to be caused by warping, where the strata dipped slightly to the east, but in the same quarries one could find slight dips in almost any direction. By comparing the height of the base of the Florence flint with the railroad grade at Blue Springs and Oketo, it was found that these rocks had a southern dip of five feet to the mile. This information, coupled with the readings taken at Odell, makes it very certain that these rocks dip to the southwest.

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[1] See PROSSER'S conclusion as to the Marshall county, Kansas rocks, Vol. V, JOUR. GEOL., p. 12.

In comparing the fossil life of the two states there are greater differences than one might expect, especially when the Upper Permian rocks are not known to Nebraska. So far there are many more lingering Coal Measure species reported from Kansas than Nebraska. As soon as the questionable species of both states have been classified, the greatest differences in the fauna will disappear. There is another interesting point that is not out of place here. There are a few species of invertebrates reported from the Texas Permian that are common to the Permian of Kansas and Nebraska, and beyond question, when the Texas species of gasteropods and pelecypods have been reported in full, there will be many more species common. It seems very probable that the Permian of Kansas and Texas was at one time connected, and that it also stretched westward and northward to, and possibly beyond, the Rocky Mountains. Many of the early geologists connected with the geological surveys of the territories considered that the uppermost rocks of the Paleozoic in the mountain region was Permian, and so recorded it; but owing to the lack of paleontological evidence, but few, if any, have ever considered this classification correct. Only recently fossil horizons of great importance have been discovered in what will in the future be known as the mountain Permian. These fossils are in part the same as those found in the Permian of Kansas and Nebraska, but with them are numerous forms new to science which are decidedly Mesozoic in character. When the mountain formations have been thoroughly investigated, the Permian area of the United States will be materially increased.

Some may question whether there are any true Permian rocks[1] in America. A discussion of this subject cannot be taken up here, but the following notes are worthy of consideration. Of the forty-four genera of invertebrates known in the Kansas and Nebraska rocks, over three fourths of them belong to the Permian of the Orient. The remainder are nearly all American genera and are chiefly pelecypods. In referring to the English Permian it will be seen that there are reported thirty species of brachiopods and thirty-seven species of pelecypods, while in America, with a fauna only partially known, there are fifteen brachiopods and between forty and fifty species of pelecypods. Besides this, there is the disappearance of the Spirifers, the most of the Producti, and the most of the typical Coal Measure species.

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[1] See PROSSER'S discussion of this subject in Vol. III, JOUR. GEOL., pp. 789–796.

Some have objected to the use of the term Permian to designate an American terrane. There seems to be no good reason for this. In this country, as in Europe and India, there is a series of rocks above the Coal Measures that cannot be consistently classified with them. While they are linked with the Paleozoic with unmistakable affinities, they are also bound to the Mesozoic by indubitable bonds. Since the term Permian has been in use many years to represent this formation, in this, as well as foreign countries, it seems ill advised at this time to introduce a new term to designate the American formations. We might as consistently cast off other period names that have had their origin in a foreign country. Since the Permian is a typical transition series, it seems advisable to speak of it as a geological period of the Paleozoic, and no longer consider it an epoch of the Carboniferous.

In order to show the close relationship of the American and foreign Permian, a table has been arranged which will give all of the genera known to the Kansas and Nebraska Permian, and also show their distribution in the foreign Permian. The resemblance is even greater than appears in the table, since it has been impossible to secure accurate data relating to many of the foreign genera.

A TABLE GIVING THE KANSAS AND NEBRASKA (AND IN PART THE TEXAS) PERMIAN INVERTEBRATE GENERA AND THEIR DISTRIBUTION IN THE FOREIGN PERMIAN

	England	Russia	Germany	India	Kansas	Nebraska	Texas
Anthozoa.							
Zaphrentis	..	..	..	..	+	..	..
Chaetetes	+	+	..	..	+	..	..
Echinoidea.							
Archaeocidaris	+	+	..	..	+	+	..
Annelida.							
Spirorbis	..	..	..	..	+	..	+
Bryozoa.							
Fenestella	+	+	+	+	..	+	..
Polypora	..	+	+	+	+	+	..
Septopora	..	..	..	+?	+	..	..
Rhombopora	..	..	..	+	+	+	..
Fistulipora	..	..	..	+	..	+	..
Brachiopoda.							
Orbiculoidea	+	+	+	..	+	+	..
Productus	+	+	+	+	+	+	..
Chonetes	+	+	+	+	+	..	..
Orthis	..	+	+	+	..	+	..
Derbya	+	..	+	+	+	+	..
Enteletes	..	..	+	+	+	..	..
Ambocoelia	..	..	..	..	+	+	..
Seminula	+	+	+	+	+	+	..
Pelecypoda.							
Aviculopecten	+	+	+	+	+	+	+
Avicula	+	..	..	+	..	+?	..
Pseudomonotis	+	+	+	+	+	+	..
Pinna	+?	+	+?	..	+	+	..
Macrodon	+?	..	..	+	+	..	..
Myalina	..	+	..	..	+	+	+
Nuculana	..	+	..	+	+	..	..
Nucula	+	+	..	+	+	..	..
Yoldia	..	..	..	..	+	+	+
Bakevellia	+	+	+	+	+	+	+
Schizodus	+	+	+	+	+	+	..
Pleurophorus	+	+	+	+	+	+	+
Scaldia	..	..	..	..	..	+	..
Edmondia	+	+	..	+	+	+	..
Solenomya	+	+	+	..	..	+	..
Ceromya ?	..	..	..	..	..	+	..
Sedgwickia	..	..	..	..	+	+	+
Chaenomya	..	..	..	..	+	+	..
Allorisma	+	+	+	+	+	+	+
Glauconema	..	..	..	..	+	..	..
Schaphopoda.							
Dentalium	+	..	+	..	+	+	..
Gasteropoda.							
Bellerophon	..	..	+	+	+	+	+
Loxonema ?	+	+	+	..	+	..	..

A LIST OF THE KANSAS AND NEBRASKA PERMIAN FOSSILS[1]

	England	Russia	Germany	India	Kansas	Nebraska	Texas
Gasteropoda.							
Macrocheilus	+	..	+	+	+	..	..
Orthonema ?	..	..	..	..	+	..	..
Aclisina	..	..	..	..	+	..	..
Strapharollus	+	..	+	+	+	+	+
Naticopsis	..	..	..	+	+	+	+
Pleurotomaria	+	+	+	+	+	+	..
Murchisonia	..	+	+	+	+	+	+
Cephalopoda.							
Orthoceras	..	..	..	+	..	+	+
Nautilus	+	..	+	+	+	+	+
Metacoceras	..	..	..	..	+	+	..
Phacoceras	..	..	..	..	+	..	..
Crustacea.							
Phillipsia	+?	..	..	..	+	..	..
Pisces.							
Styptobasis	..	..	..	..	..	+	..
Diplodus	..	..	..	..	..	+	..

	Nebraska	Kansas	Texas
Fistulipora sp	+	..	..
Chaetetes cf. *carbonaria* Worth	..	+	..
Zaphrentis sp	..	+	..
Archaeocideris sp	+	..	..
Archaeocideris sp	..	+	..
Spirorbis cf. *permianus* King	..	+	..
Spirorbis? orbiculostoma Swal	..	+	..
Spirorbis sp	..	+	..
Fenestella shumardi Prout	..	+	..
Fenestella sp	+	..	..
Polypora submarginata Meek	..	+	..
Polypora sp	+	..	..
Rhombopora lepidendroides Meek	+?	+	..
Rhombopora sp	+	..	..
Septopora biserialis Swal	..	+	..
Orbiculoidea sp	..	+	..
Orbiculoidea sp	+	..	..
Orbiculoidea sp	+	..	..
Productus semireticulatus Martin	+	+	..
Productus semireticulatus calhouni Swal	..	+	..
Productus nebrascensis Owen	..	+	..
Productus costqtus Sowb	..	+	..
Chonetes granulifera Owen	..	+	..
Orthis sp	+	..	..
Derbya crassa M. & H	+	+	..
Derbya multistriata M. & H.	..	+	..
Derbya robusta Hall	+	..	..
Meekella striaticostata Cox	+	+	+
Meekella shumardiana Swal	..	+	..

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[1] The fossils reported from Kansas are those that have recently been reported by Professor Prosser. The Texas list has been reported by Professor Cummings, and the Nebraska from my collections.

A LIST OF THE KANSAS AND NEBRASKA PERMIAN FOSSILS—*continued*

	Nebraska	Kansas	Texas
Meekella sp	+	..	..
Enteletes hemiplicata Hall	+	+	..
Ambocoelia planoconvexa Shum	+	+	..
Seminula argentia Shep	+	+	..
Aviculopecten occidentallis Shum	+	+	+
Aviculopecten carboniferous Stevens	..	+	..
Aviculopecten maccoyi M. & H.	+	+	..
Aviculopecten sp	+	..	..
?Avicula cf. *lanceolata*[1]	+	..	..
Pseudomonotis hawni M. & H.	+	+	..
Pseudomonotis hawni ovata M. & H	+	+	..
Pseudomonotis cf. *variabilis* Swal.	..	+	..
Pseudomonotis sp	+	..	..
Pinna peracuta Shum	+	+	..
Pinna sp. nov	+	..	..
Pinna sp. nov	+	..	..
Pinna sp. nov	+	..	..
Myalina recurvirostris M. & W	..	+	..
Myalina perattenuata M. & H.	+	+	+
Myalina kansasensis Shum	..	+	..
Myalina permiana Swal	+	+	+
Myalina aviculoides M. & H.	+	..	+
Myalina swallovi McChes.	..	+	..
Myalina sp	+	..	..
Nuculana bellistriata attenuata Meek	..	+	..
Nucula cf. *beyrichi* Schauroth	..	+	..
Yoldia subscitula M. & H	+	+	+
Bakevellia parva M. & H.	+	+	..
Schizodus curtus M. & H.	..	+	..
Schizodus ovatus M. & H	+	+	..
Schizodus wheeleri Swal	+	..	..
Schizodus cf. *curtiformis* Walcott	..	+	..
Schizodus sp.	+	..	..
Schizodus sp.	+	.	..
Pleurophorus subcostatus M. & W	..	+	..
Pleurophorus cf. *oblongus* Meek.	..	+	..
Pleurophorus subcuneatus M. & H.	..	+	..
Pleurophorus sp	+	..	..
Pleurophorus sp	..	+	..
Scaldia sp. nov	+	..	..
Edmondia calhouni M. & H.?[2]	..	+	..
Edmondia cf. *nebrascensis* Gein.	..	+	..
Edmondia sp.	+	..	..
Edmondia sp.	..	+	..
Solenomya sp	+	..	..
Solenomya sp	+	..	..
?? Ceromya sp. nov.	+	..	..
Sedgwickia altirostrata M. & H	+?	+	..
Chaenomya minnehaha Swal	+	+	..
Chaenomya laevenworthensis M. & H	+	..	..

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[1] Atlas of Fossil Conchology, Brown, Plate LXIX, Fig. 3.

[2] This has recently been referred to Pleurophorus. See Bull. U. S. Geol. Surv., No. 153, by STUART WELLER, p. 242.

A LIST OF THE KANSAS AND NEBRASKA PERMIAN FOSSILS—*continued*

	Nebraska	Kansas	Texas
Allorisma subcuneatum M. & H.	+	+	+
Allorisma cf. *elegans* King	+	. .	. .
? *Glauconome* sp.[1]	. .	+	. .
Dentalium meekanum Gein (?).	. .	+	. .
Dentalium sp.	+	. .	. .
Bellerophon montfortanus N. & P.	+	+	+
Bellerophon, cf. *sublaevis* Hall.	. .	+	. .
Bellerophon marcouanus Gein	+	. .	. .
Bellerophon sp	+	. .	. .
Bellerophon sp	. .	+	. .
Loxonema ? sp.	+	+	. .
Macrocheilus angulifera White[2]	. .	+	. .
Orthonema ? sp	. .	+	. .
Aclisina robusta Stevens.	. .	+	. .
Aclisina swallovana Gein	. .	+	. .
Strapharollus subrugosus M. & W	+	+	. .
Strapharollus subquadratus M. & W	. .	+	+
Strapharollus pernodosus M. & W.	. .	+	. .
Naticopsis, cf. *remex* White	+	. .	+
Pleurotomaria sp.	+	. .	. .
Murchisonia, cf. *nebrascensis* Gein	+	. .	. .
Murchisonia sp. nov	+	. .	. .
Orthoceras sp.	+	. .	. .
Nautilus eccentricus M. & H.	+	+	. .
Metacoceras dubium Hyatt.	+	+	. .
Metacoceras sp	+	. .	. .
Metacoceras sp	+	. .	. .
Phacoceras dumbli Hyatt	. .	+	. .
Phillipsia sangamonsis M. & W	. .	+	. .
Phillipsia sp.	. .	+	. .
Styptobasis knightiana Cope	+	. .	. .
Diplodus sp. nov.	+	. .	. .

W. C. KNIGHT.

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[1] Referred by STUART WELLER to Pinnatopora. See Bull. U. S. Geol. Surv., No. 153, p. 288.

[2] Conditionally reterred to *Soleniscus angulifera*. See Bull. U. S. Geol. Surv., No. 153, p. 339.